

ABSTRACT

Waste management issues in university areas remain a complex challenge, primarily due to the lack of public awareness in waste separation and limited real-time monitoring systems for waste container conditions. This situation often results in waste accumulation that is not optimally managed, causing adverse impacts on the surrounding ecosystem.

In response to this problem, an innovative solution has been developed in the form of a smart waste bin that utilizes Internet of Things (IoT) technology and is integrated with a Global Positioning System (GPS). This device has the capability to automatically identify and classify three categories of waste—metal materials, organic waste, and inorganic waste—using a combination of proximity sensors, gas sensors, and ultrasonic sensors.

The ESP32 microcontroller functions as the main processing unit that coordinates all sensors and transmits information directly to the cloud platform. Data regarding waste categories, container capacity levels, and current geographical positions can be accessed through the SmartBin application developed for the Android platform. The application also provides an automatic notification system for cleaning teams when waste volume reaches maximum limits, and is equipped with a digital map to track device locations.

Implementation and evaluation results demonstrate that this system has stable performance in waste classification and monitoring processes, while providing convenience in digital technology-based waste management. This innovation has the potential to become a long-term alternative for optimizing effectiveness and fostering public awareness in maintaining environmental cleanliness, particularly in academic areas and other public infrastructure.

Keywords: Application, GPS, IoT, Trash Can